CLAIMS

1. Apparatus for treating a subject suffering from spontaneous atrial fibrillation (AF), comprising:

an electrode device, adapted to be coupled to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the site, and

configure the current to maintain the spontaneous AF for at least about 24 hours, so as to treat the subject.

2. Apparatus according to claim 1,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

3. Apparatus according to claim 1,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the current includes a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

4. Apparatus according to claim 1, wherein the control unit is adapted to drive the electrode device to configure the current to maintain the AF for between about 24 hours and about three weeks.

5. Apparatus according to claim 1, wherein the control unit is adapted to drive the electrode device to configure the current to maintain the AF for at least about three weeks.

6. Apparatus according to claim 1, comprising a sensor adapted to detect normal sinus rhythm (NSR) and generate a sensor signal responsive thereto, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

7. Apparatus according to claim 1, comprising a sensor adapted to detect the AF and generate a sensor signal responsive thereto, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

8. Apparatus according to claim 1, comprising a cardiac electrode device, adapted to be coupled to cardiac tissue of the subject, and wherein the control unit is adapted to:

drive the cardiac electrode device to apply a cardiac electrical current to the cardiac tissue, and

configure the cardiac electrical current to maintain the spontaneous AF, so as to treat the subject.

9. Apparatus according to claim 1, wherein the control unit is adapted to drive the electrode device to apply the current with an amplitude of between about 2 and about 5 milliamps.

10. Apparatus according to any one of claims 1-9, wherein the control unit is adapted to drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject.

11. Apparatus according to claim 10, wherein the control unit is adapted to configure each pulse of each of the bursts to have a pulse duration of between about 1 and about 3 milliseconds.

12. Apparatus according to claim 10, wherein the control unit is adapted to configure each burst to have between about 1 and about 8 pulses.

13. Apparatus for treating a subject suffering from spontaneous atrial fibrillation (AF), comprising:

an electrode device, adapted to be coupled to tissue of the subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the tissue, and

configure the current to maintain the spontaneous AF for at least about 24 hours, so as to treat the subject.

14. Apparatus according to claim 13, wherein the control unit is adapted to configure the current to maintain the AF for between about 24 hours and about three weeks.

15. Apparatus according to claim 13, wherein the control unit is adapted to configure the current to maintain the AF for at least about three weeks.

16. Apparatus according to claim 13, comprising a sensor adapted to detect normal sinus rhythm (NSR) and generate a sensor signal responsive thereto, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

17. Apparatus according to claim 13, comprising a sensor adapted to detect the AF and generate a sensor signal responsive thereto, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

18. Apparatus according to claim 13, wherein the control unit is adapted to drive the electrode device to apply the current at a frequency of at least about 3 Hz.

19. Apparatus according to any one of claims 13-18, wherein the tissue includes cardiac tissue of the subject, and wherein the electrode device is adapted to be coupled to the cardiac tissue.

20. Apparatus according to any one of claims 13-18, wherein the tissue is selected from the list consisting of: atrial tissue, cardiac fat pad tissue, a pulmonary vein, a carotid artery, a carotid sinus, a vena cava vein, and an internal jugular vein, and wherein the electrode device is adapted to be coupled to the selected tissue.

21. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to tissue of a subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the tissue, and

configure the current to modify atrial motion of the subject to a level sufficient to reduce a risk of an occurrence of a thromboembolic event.

22. Apparatus according to claim 21, wherein the control unit is adapted to configure the current to modify blood flow within an atrium of the subject.

23. Apparatus according to claim 21, wherein the electrode device is adapted to be coupled to the tissue of the subject, the subject suffering from atrial fibrillation (AF) or from increased risk of thromboembolic events.

24. Apparatus according to claim 21, wherein the control unit is adapted to configure the current to increase blood flow out of a left atrial auricle of the subject.

25. Apparatus according to claim 21, comprising a sensor adapted to detect an occurrence of atrial fibrillation (AF) and generate a sensor signal responsive thereto, wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current during the occurrence of the AF.

26. Apparatus according to claim 21, comprising a sensor adapted to detect an occurrence of atrial fibrillation (AF) and generate a sensor signal responsive thereto, wherein the control unit is adapted to drive the electrode device to apply the current in the absence of the occurrence of the AF.

27. Apparatus according to any one of claims 21-26, wherein the tissue includes cardiac tissue of the subject, and wherein the electrode device is adapted to be coupled to the cardiac tissue.

28. Apparatus according to any one of claims 21-26, wherein the tissue is selected from the list consisting of: atrial tissue, cardiac fat pad tissue, a pulmonary vein, a carotid artery, a carotid sinus, a vena cava vein, and an internal jugular vein, and wherein the electrode device is adapted to be coupled to the selected tissue.

29. Apparatus according to any one of claims 21-26, wherein the tissue includes a vagus nerve of the subject, and wherein the electrode device is adapted to be coupled to the vagus nerve.

30. Apparatus according to claim 29,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of

nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

31. Apparatus according to claim 29,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

32. Apparatus according to claim 29, wherein the control unit is adapted to:

during a first stimulation period, configure the current to cause a reduction in a force of contraction of atrial cells of the subject, and

during a second stimulation period, configure the current to cause an increase in the reduced force of contraction of the atrial cells.

33. Apparatus according to claim 32, wherein the control unit is adapted to set the first stimulation period to have a duration of between about 100 milliseconds and about 1000 milliseconds.

34. Apparatus according to claim 32, wherein the control unit is adapted to set the second stimulation period to have a duration of between about 200 milliseconds and about 15 seconds.

35. Apparatus according to claim 32, wherein the control unit is adapted to configure the current to have a first frequency during the first stimulation period, and a second frequency during the second stimulation period, the first frequency greater than the second frequency.

36. Apparatus according to claim 32, wherein the control unit is adapted to configure the current to have a first amplitude during the first stimulation period, and a second amplitude during the second stimulation period, the first amplitude greater than the second amplitude.

37. Apparatus according to claim 32, wherein the control unit is adapted to:

drive the electrode device to apply the current during the first stimulation period, and

withhold the electrode device from applying the current during the second stimulation period.

38. Apparatus according to claim 32, wherein the control unit is adapted to:

during the first stimulation period, configure the current so as to induce action potentials in the vagus nerve, and

during the second stimulation period, configure the current so as to block action potentials in the vagus nerve.

39. Apparatus according to claim 32, wherein the control unit is adapted to configure the current so as to induce action potentials in the vagus nerve during the first and the second stimulation periods.

40. Apparatus according to claim 32, wherein the control unit is adapted to:

drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject, and

configure each pulse of each of the bursts to have a pulse width of at least a first pulse width during the first stimulation period, and to have a pulse width of less than a second pulse width during the second stimulation period, the first pulse width being greater than or equal to the second pulse width.

41. Apparatus according to claim 32, wherein the control unit is adapted to:

drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject, and

configure each of the bursts to have a number of pulses of at least a first number of pulses during the first stimulation period, and to have a number of pulses of less than a second number of pulses during the second stimulation period, the first number of pulses being greater than or equal to the second number of pulses.

42. Apparatus according to any one of claims 32-41, comprising a sensor, adapted to sense at least one physiological variable of the subject, and to generate a sensor signal responsive thereto, and wherein the control unit is adapted to receive the sensor signal and to synchronize therewith a commencement of at least one of the first and second stimulation periods.

43. Apparatus according to claim 42, wherein the sensed physiological variable includes a QRS-complex of the subject, and wherein the control unit is adapted to initiate the first stimulation period within about 50 milliseconds after an occurrence of the QRS-complex.

44. Apparatus according to claim 42, wherein the sensed physiological variable includes an expiration by the subject, and wherein the control unit is adapted to initiate the first stimulation period within about 500 milliseconds after a beginning of the expiration.

45. Apparatus according to claim 42, wherein the sensed physiological variable includes diastole of the subject, and wherein the control unit is adapted to initiate the second stimulation period substantially simultaneously with a portion of the diastole.

46. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the site, and

repeatedly change at least one parameter of the current, so as to restore normal sinus rhythm (NSR) of the subject.

47. Apparatus according to claim 46,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

48. Apparatus according to claim 46,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

49. Apparatus according to claim 46, wherein the parameter includes an amplitude of the current, and wherein the control unit is adapted to repeatedly change the amplitude.

50. Apparatus according to claim 46, wherein the parameter includes a frequency of the current, and wherein the control unit is adapted to repeatedly change the frequency.

51. Apparatus according to claim 46,

wherein the control unit is adapted to drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject,

wherein the parameter includes a number of pulses in each of the bursts, and

wherein the control unit is adapted to repeatedly change the number of pulses in each of the bursts.

52. Apparatus according to claim 46,

wherein the control unit is adapted to drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject,

wherein the parameter includes a pulse width of pulses in each of the bursts, and

wherein the control unit is adapted to repeatedly change the pulse width of the pulses in each of the bursts.

53. Apparatus according to claim 46, wherein the control unit is adapted to drive the electrode device to apply the electrical current in pulses, wherein the parameter includes a pulse width of the pulses, and wherein the control unit is adapted to repeatedly change the pulse width.

54. Apparatus according to claim 46, wherein the parameter includes an on/off status of the current, and wherein the control unit is adapted to repeatedly change the on/off status.

55. Apparatus according to claim 46, wherein the control unit is adapted to:

during a first period, configure the current so as to induce action potentials in the site, and

during a second period, configure the current so as to block action potentials in the site.

56. Apparatus according to claim 46, wherein the control unit is adapted to repeatedly change the parameter at a rate of between about one change per heart beat of the subject and about one change per 30 seconds.

57. Apparatus according to claim 46, wherein the control unit is adapted to repeatedly change the parameter according to a predetermined pattern.

58. Apparatus according to any one of claims 46-57, wherein the control unit is adapted to repeatedly change the parameter randomly.

59. Apparatus according to claim 58, wherein the control unit is adapted to repeatedly change the parameter randomly, with an interval between each change of between about 500 milliseconds and about 30 seconds.

60. Apparatus according to any one of claims 46-57, comprising a sensor, adapted to detect an occurrence of the AF and generate a sensor signal indicative thereof, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

61. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

a pacing device, adapted to be applied to a heart of the subject; and

a control unit, adapted to:

during a first period, drive the pacing device to pace the heart, and drive the electrode device to apply an electrical current to the site, and

during a second period following the first period, withhold the electrode device from applying the electrical current to the site.

62. Apparatus according to any one of claims 61 or 286,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

63. Apparatus according to any one of claims 61 or 286,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

64. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to withhold the pacing device from pacing the heart during at least a portion of the second period.

65. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to configure the first period to have a duration of between about 500 milliseconds and about 30 seconds.

66. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to drive the electrode device to apply the electrical current substantially without changing the parameter during the first period, and with an amplitude greater than about 6 milliamps.

67. Apparatus according to any one of claims 61 or 286, comprising a sensor, adapted to detect an occurrence of the AF and generate a sensor signal indicative thereof, and wherein the control unit is adapted to receive the sensor signal, and to drive the pacing

device and drive the electrode device to apply the electrical current responsive to the sensor signal.

68. Apparatus according to any one of claims 61 or 286, comprising a sensor, adapted to detect an occurrence of the AF and generate a sensor signal indicative thereof, and wherein the control unit is adapted to receive the sensor signal, and to withhold the electrode device from applying the electrical current responsive to the sensor signal.

69. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

a pacing device, adapted to be applied to a heart of the subject;

a sensor, adapted to detect an occurrence of the AF and generate a sensor signal indicative thereof; and

a control unit, adapted to:

during a first period, drive the pacing device to pace the heart, and drive the electrode device to apply an electrical current to the site, and

responsive to the sensor signal, during a second period following the first period, withhold the electrode device from applying the electrical current to the site.

70. Apparatus according to claim 69,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

71. Apparatus according to claim 69,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

72. Apparatus according to claim 69, wherein the control unit is adapted to, during the first period, drive the pacing device and drive the electrode device to apply the current responsive to the sensor signal.

73. Apparatus according to claim 69, wherein the control unit is adapted to withhold the pacing device from pacing the heart during at least a portion of the second period.

74. Apparatus according to claim 69, wherein the control unit is adapted to drive the electrode device to apply the electrical current substantially without changing a parameter of the current during the first period, and with an amplitude greater than about 6 milliamps.

75. Apparatus according to claim 69, wherein the control unit is adapted to withhold the electrode device from applying the electrical current during the second period responsive to an indication in the sensor signal of a P-wave of the subject.

76. Apparatus according to claim 69, wherein the sensor is adapted to generate the sensor signal responsive to a measure of at least one ventricular response parameter, the parameter selected from the list consisting of: a ventricular response rate and a ventricular response variability.

77. Apparatus according to claim 69, wherein the sensor is adapted to generate the sensor signal responsive to a measure of pressure, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure.

78. Apparatus according to claim 69,

wherein the sensor signal includes a first sensor signal and a second sensor signal,

wherein the first sensor signal includes a measure of pressure, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure,

wherein the second sensor signal includes an indication of ventricular contraction,

wherein the sensor is adapted to generate the first and the second sensor signals, and

wherein the control unit is adapted to receive the first and the second sensor signals, and to detect the AF by analyzing at least one relationship between the first and the second sensor signals.

79. Apparatus according to any one of claims 69-78,

wherein the sensor signal includes an electrocardiogram (ECG) signal,

wherein the sensor is adapted to measure the ECG signal, and

wherein the control unit is adapted to receive the ECG signal, and to detect the AF by analyzing a duration of an isoelectrical segment of the ECG signal.

80. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to a site of a subject suffering from atrial fibrillation (AF) principally caused by heightened adrenergic tone, the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to drive the electrode device to apply to the site an electrical stimulating current, which current is capable of inducing action potentials in the site, the current configured to be such as to restore normal sinus rhythm (NSR) of the subject.

81. Apparatus according to claim 80,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the stimulating current so as to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve, and

wherein the control unit is adapted to drive the electrode device to apply to the vagus nerve an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

82. Apparatus according to claim 80,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve, and

wherein the control unit is adapted to drive the electrode device to apply to the vagus nerve an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction towards a brain of the subject.

83. Apparatus according to claim 80, comprising a sensor, adapted to detect an occurrence of the AF and generate a sensor signal indicative thereof, and wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the stimulating current responsive to the sensor signal.

84. Apparatus according to claim 80, wherein the control unit is adapted to apply the stimulating current in respective bursts in each of a plurality of cardiac cycles of the subject, each pulse of each of the bursts having a pulse width of between about 0.5 milliseconds and about 1.5 milliseconds.

85. Apparatus according to claim 80, wherein the control unit is adapted to apply the stimulating current in respective bursts in each of a plurality of cardiac cycles of the subject, each of the bursts having between about 1 and about 10 pulses.

86. Apparatus according to any one of claims 80-85 or 359, wherein the control unit is adapted to apply the stimulating current in respective bursts synchronized with a cardiac cycle of the subject.

87. Apparatus according to claim 86, wherein the control unit is adapted to apply a first pulse of each of the bursts after a delay from a sensed feature of an electrocardiogram (ECG) of the subject.

88. Apparatus according to claim 87, wherein the sensed feature is selected from the list consisting of: a P-wave of the ECG and an R-wave of the ECG, and wherein the control unit is adapted to apply the first pulse after the delay from the selected sensed feature.

89. Apparatus for use during defibrillation of a subject suffering from atrial fibrillation (AF), comprising:

an electrode device, adapted to be coupled to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a

pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the site, and

configure the current to cause bradycardia and a decreased level of alertness during the defibrillation.

90. Apparatus according to claim 89,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

91. Apparatus according to claim 89,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve.

92. Apparatus according to claim 89,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve, and

wherein the control unit is adapted to:

apply an inhibiting electrical signal to the vagus nerve, and

configure the inhibiting signal to block action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject.

93. Apparatus according to claim 89, comprising a pacing device, adapted to be applied to a heart of the subject, wherein the control unit is adapted to drive the pacing device to pace the heart if a heart rate of the subject falls below a predetermined rate responsive to application of the current configured to cause the decreased level of alertness.

94. Apparatus according to claim 89, wherein the control unit is adapted to drive the electrode device to apply the current with an amplitude of between about 4 and about 8 milliamps.

95. Apparatus according to any one of claims 89-94, wherein the control unit is adapted to drive the electrode device to apply the current in respective bursts in each of a plurality of cardiac cycles of the subject.

96. Apparatus according to claim 95, wherein the control unit is adapted to configure each pulse of each of the bursts to have a pulse duration of between about 1 and about 3 milliseconds.

97. Apparatus according to claim 95, wherein the control unit is adapted to configure each burst to have between about 6 and about 10 pulses.

98. Apparatus for treating a subject suffering from atrial fibrillation (AF), comprising:

an electrode device, adapted to be coupled to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

a sensor, adapted to be applied to tissue of the subject, and to generate at least one sensor signal responsive to a sensed physiological parameter of the subject; and

a control unit, adapted to:

detect the AF by receiving and analyzing the at least one sensor signal,

responsive to detecting the AF, drive the electrode device to apply an electrical current to the site,

during a first period beginning upon detecting the AF, configure the current to attempt to restore normal sinus rhythm (NSR) of the subject,

determine whether NSR has been restored, and

during a second period beginning responsive to determining that NSR has not been restored within a threshold period of time after detecting the AF, configure the current to maintain AF.

99. Apparatus according to claim 98,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in a first set and a second set of nerve fibers of the vagus nerve, and an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve, responsive to detecting the AF.

100. Apparatus according to claim 98,

wherein the site includes the vagus nerve,

wherein the electrode device is adapted to be coupled to the vagus nerve,

wherein the control unit is adapted to configure the current to include a stimulating current, which is capable of inducing action potentials in the vagus nerve, and an inhibiting current, which is capable of inhibiting device-induced action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current and the inhibiting current to the vagus nerve, responsive to detecting the AF.

101. Apparatus according to claim 98, wherein the sensed physiological parameter includes a P-wave of the subject, and wherein the sensor is adapted to generate the sensor signal responsive to the P-wave.

102. Apparatus according to claim 98, wherein the sensed physiological parameter includes a measure of at least one ventricular response parameter of the subject, the parameter selected from the list consisting of: a ventricular response rate and a ventricular response variability, and wherein the sensor is adapted to generate the sensor signal responsive to the ventricular response parameter.

103. Apparatus according to claim 98, wherein the sensed physiological parameter includes a measure of pressure of the subject, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure, and wherein the sensor is adapted to generate the sensor signal responsive to the measure of the pressure.

104. Apparatus according to claim 98,

wherein the sensed physiological parameter includes a first sensed physiological parameter and a second sensed physiological parameter,

wherein the first sensed physiological parameter includes a measure of pressure of the subject, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure,

wherein the second sensed physiological parameter includes an indication of ventricular contraction of the subject,

wherein the sensor is adapted to generate a first sensor signal and a second sensor signal responsive to the measure of pressure and the indication of ventricular contraction, respectively, and

wherein the control unit is adapted to receive the first and the second sensor signals, and to detect the AF by analyzing at least one relationship between the first and the second sensor signals.

105. Apparatus according to claim 98,

wherein the sensed physiological parameter includes an electrocardiogram (ECG) signal of the subject,

wherein the sensor is adapted to generate the sensor signal responsive to the ECG signal, and

wherein the control unit is adapted to receive the sensor signal, and to detect the AF by analyzing a duration of an isoelectrical segment of the ECG signal.

106. Apparatus according to claim 98, wherein the control unit is adapted to configure the current to attempt to restore NSR by repeatedly changing at least one parameter of the current.

107. Apparatus according to claim 98, comprising a pacing device, adapted to be applied to a heart of the subject, wherein the control unit is adapted to attempt to restore NSR during the first period by:

during a pacing period within the first period, driving the pacing device to pace the heart, and driving the electrode device to apply the current to the site, and

during a withholding period following the pacing period, withholding the electrode device from applying the current to the site.

108. Apparatus according to claim 98, wherein the control unit is adapted to generate a notification signal upon determining that NSR has been restored.

109. Apparatus according to any one of claims 98-108, wherein the control unit is adapted to maintain a duration of the threshold period between about 24 and 54 hours.

110. Apparatus according to claim 109, wherein the control unit is adapted to maintain a duration of the threshold period between about 44 and 52 hours.

111. Apparatus according to any one of claims 98-108, wherein the control unit is adapted to record a time of detecting of the AF.

112. Apparatus according to claim 111, wherein the control unit is adapted to output the recorded time upon interrogation by a user.

113. Apparatus for nerve stimulation, comprising an electrode device,

adapted to be coupled to a nerve of a subject, the nerve including a first set of fibers situated in a vicinity of an external surface of the nerve, and a second set of fibers situated in a vicinity of a longitudinal axis of the nerve, and

adapted to generate an electrical field defining a first activation function at the first set of fibers, and defining a second activation function at the second set of fibers, the first activation function being less than about four times greater than the second activation function.

114. Apparatus according to claim 113, wherein the electrode device is adapted to be fixed to the nerve.

115. Apparatus according to claim 113, wherein the electrode device comprises one or more electrodes having respective conductive surfaces, which are adapted to be coupled to the nerve such that a distance between each of the conductive surfaces and the axis of the nerve is at least about 0.5 millimeters.

116. Apparatus according to claim 113, wherein the nerve includes a vagus nerve of the subject, and wherein the electrode device is adapted to be coupled to the vagus nerve.

117. Apparatus according to any one of claims 113-116, wherein the electrode device is adapted to generate the electrical field by applying a current having an amplitude of at least 5 milliamps.

118. Apparatus according to claim 117, wherein the electrode device is adapted to generate the electrical field by applying the current having an amplitude of at least 7 milliamps.

119. Apparatus for nerve stimulation, comprising:

one or more electrodes having respective conductive surfaces, which are adapted to be coupled to a nerve of a subject such that a distance between each of the conductive surfaces and an axis of the nerve is at least about 0.5 millimeters; and

a control unit, adapted to drive the electrodes to apply a current having an amplitude of at least 5 milliamps.

120. Apparatus according to claim 119, comprising one or more insulating elements that separate the electrodes from one another, such that a distance between each of the insulating elements and the axis of the nerve is between about 0.5 and about 3 millimeters.

121. Apparatus according to claim 119, wherein the control unit is adapted to drive the electrodes to apply the current having an amplitude of at least 7 milliamps.

122. Apparatus according to claim 119, wherein the nerve includes a vagus nerve of the subject, and wherein the electrodes are adapted to be coupled to the vagus nerve.

123. Apparatus according to claim 119, wherein the electrodes are adapted to be coupled to the nerve such that the distance between each of the conductive surfaces and the axis of the nerve is at least about 1.5 millimeters.

124. Apparatus according to claim 119, wherein the electrodes are adapted to be coupled to the nerve such that the distance between each of the conductive surfaces and the axis of the nerve is less than about 2 millimeters.

125. Apparatus according to any one of claims 119-124, wherein the electrodes are adapted to be coupled to the nerve such that the distance between each of the conductive surfaces and the axis of the nerve is at least about 3 millimeters.

126. Apparatus for stimulating a nerve of a subject, the nerve including small-, medium-, and large-diameter fibers, the apparatus comprising:

a cathode, adapted to be disposed at a cathodic site of the nerve, and to apply a cathodic current to the nerve which is capable of inducing action potentials in the nerve;

an anode, adapted to be disposed at an anodal site of the nerve, and to apply to the nerve an anodal current which is capable of inhibiting action potentials in the nerve; and

a control unit, adapted to:

drive the cathode to apply to the nerve the cathodic current having a cathodic amplitude sufficient to induce action potentials in the medium- and large-diameter fibers, but generally insufficient to induce action potentials in the small-diameter fibers, and

simultaneously drive the anode to apply to the nerve the anodal current having an anodal amplitude sufficient to inhibit action potentials in the large-diameter fibers, but generally insufficient to inhibit action potentials in the medium-diameter fibers.

127. Apparatus according to claim 126, wherein the nerve includes a vagus nerve of the subject, wherein the cathode is adapted to be disposed at the cathodic site of the vagus nerve, and wherein the anode is adapted to be disposed at the anodal site of the vagus nerve.

128. Apparatus according to any one of claims 126 or 127,

wherein the nerve includes a first set of fibers situated in a vicinity of an external surface of the nerve, and a second set of fibers situated in a vicinity of a longitudinal axis of the nerve, and

wherein the cathode is adapted to generate an electrical field defining a first activation function at the first set of fibers, and defining a second activation function at the second set of fibers, the first activation function less than about four times greater than the second activation function.

129. Apparatus according to claim 128, wherein the control unit is adapted to set the cathodic amplitude to be between about 1 and about 10 milliamps.

130. Apparatus according to claim 128, wherein the control unit is adapted to set the anodal amplitude to be between about 1 and about 10 milliamps.

131. Apparatus according to any one of claims 126 or 127, comprising a suppression anode, adapted to:

be disposed at a suppression anodal site of the nerve so that the cathodic site is between the anodal site and the suppression anodal site, and

apply to the nerve a suppression anodal current having a suppression anodal amplitude sufficient to inhibit action potentials induced in the nerve by the cathodic current and propagating in a direction from the cathodic site towards the suppression anodal site.

132. Apparatus according to claim 131, wherein the suppression anode is adapted to apply the suppression anodal current with the suppression anodal amplitude sufficient to inhibit a portion of the action potentials induced in the nerve by the cathodic current and propagating towards the suppression anodal site.

133. Apparatus, comprising:

an electrode device, adapted to be coupled to a nerve of a subject; and

a control unit, adapted to:

drive the electrode device to apply to the nerve a stimulating current, which has a stimulating amplitude sufficient to induce action potentials in a first set and a second set of nerve fibers of the nerve, but not in a third set of nerve fibers of the nerve, the nerve fibers in the first set having generally larger diameters than the nerve fibers in the second set, and the nerve fibers in the second set having generally larger diameters than the nerve fibers in the third set, and

drive the electrode device to apply to the nerve an inhibiting current, which has an inhibiting amplitude sufficient to inhibit the induced action potentials in the first set of nerve fibers, but not in the second set of nerve fibers.

134. Apparatus according to claim 133, wherein the nerve includes a vagus nerve of the subject, and wherein the electrode device is adapted to be coupled to the vagus nerve.

135. Apparatus according to claim 133, wherein the control unit is adapted to:

drive the electrode device to apply the stimulating current, configured to induce the action potentials in an efferent therapeutic direction towards a heart of the subject, and

drive the electrode device to apply the inhibiting current, configured to inhibit the induced action potentials traveling in the efferent therapeutic direction in the first set of nerve fibers.

136. Apparatus according to claim 133, wherein the control unit is adapted to:

drive the electrode device to apply the stimulating current, configured to induce the action potentials in an afferent therapeutic direction towards a brain of the subject, and

drive the electrode device to apply the inhibiting current, configured to inhibit the induced action potentials traveling in the afferent therapeutic direction in the first set of nerve fibers.

137. Apparatus according to any one of claims 133-136,

wherein the nerve includes a surface set of fibers situated in a vicinity of an external surface of the nerve, and an axial set of fibers situated in a vicinity of a longitudinal axis of the nerve, and

wherein the control unit is adapted to drive the electrode device to apply the stimulating current to generate an electrical field defining a first activation function at the surface set of fibers, and defining a second activation function at the axial set of fibers, the first activation function less than about four times greater than the second activation function.

138. Apparatus according to claim 137, wherein the control unit is adapted to configure the stimulating amplitude to be between about 1 and about 10 milliamps.

139. Apparatus according to claim 137, wherein the control unit is adapted to configure the inhibiting amplitude to be between about 1 and about 10 milliamps.

140. A treatment method, comprising:

applying an electrical current to a site of a subject identified as suffering from spontaneous atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

configuring the current to treat the subject by maintaining the spontaneous AF for at least about 24 hours.

141. A method according to claim 140, wherein configuring the current comprises configuring the current to maintain the AF for at least about three weeks.

142. A method according to claim 140, comprising administering to the subject a drug that is appropriate for the subject when the subject is experiencing AF and inappropriate for the subject when the subject is experiencing normal sinus rhythm (NSR).

143. A method according to any one of claims 140-142, wherein configuring the current comprises configuring the current to maintain the AF for a period of between about 24 hours and about three weeks.

144. A method according to claim 143, comprising administering anticoagulation drug therapy to the subject while maintaining the spontaneous AF.

145. A method according to claim 143, comprising attempting cardioversion after the period.

146. A method according to claim 140,

wherein applying the current to the site comprises applying a stimulating current and an inhibiting current to the vagus nerve, and

wherein configuring the current comprises configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve, and configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

147. A method according to claim 140,

wherein applying the current to the site comprises applying a stimulating current and an inhibiting current to the vagus nerve, and

wherein configuring the current comprises configuring the stimulating current to induce action potentials in the vagus nerve, and configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

148. A method according to claim 140, comprising detecting normal sinus rhythm (NSR) of the subject, wherein applying the current comprises applying the current responsive to the detecting.

149. A method according to claim 140, comprising:

applying a cardiac electrical current to cardiac tissue of the subject; and

configuring the cardiac electrical current to maintain the spontaneous AF, so as to treat the subject.

150. A method according to claim 140, wherein configuring the current comprises configuring the current to have an amplitude of between about 2 and about 5 milliamps.

151. A method according to any one of claims 140-142 or 146-150, wherein configuring the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject.

152. A method according to claim 151, wherein configuring the current comprises configuring each pulse of each of the bursts to have a pulse duration of between about 1 and about 3 milliseconds.

153. A method according to claim 151, wherein configuring the current comprises configuring each burst to have between about 1 and about 8 pulses.

154. A treatment method, comprising:

identifying a subject suffering from spontaneous atrial fibrillation (AF);

applying a treatment to the subject; and

configuring the treatment to treat the subject by maintaining the spontaneous AF for at least about 24 hours.

155. A method according to claim 154, wherein applying the treatment comprises administering a drug to the subject.

156. A method according to claim 154, wherein applying the treatment comprises performing surgery on the subject.

157. A method according to claim 154, wherein configuring the treatment comprises configuring the treatment to maintain the AF for between about 24 hours and about three weeks.

158. A method according to claim 154, wherein configuring the treatment comprises configuring the treatment to maintain the AF for at least about three weeks.

159. A method according to claim 154, comprising detecting normal sinus rhythm (NSR) of the subject, wherein applying the treatment comprises applying the treatment responsive to the detecting.

160. A method according to any one of claims 154-159, wherein applying the treatment comprises applying an electrical current to tissue of the subject.

161. A method according to claim 160, wherein applying the electrical current comprises applying the electrical current at a frequency of at least about 3 Hz.

162. A method according to claim 160, wherein the tissue includes cardiac tissue of the subject, and wherein applying the electrical current comprises applying the electrical current to the cardiac tissue.

163. A method according to claim 160, wherein the tissue is selected from the list consisting of: atrial tissue, cardiac fat pad tissue, a pulmonary vein, a carotid artery, a carotid sinus, a vena cava vein, and an internal jugular vein, and wherein applying the electrical current comprises applying the electrical current to the selected tissue.

164. A treatment method, comprising:

applying an electrical current to tissue of a subject; and

configuring the current to modify atrial motion of the subject to a level sufficient to reduce a risk of an occurrence of a thromboembolic event.

165. A method according to claim 164, wherein configuring the current comprises configuring the current to modify blood flow within an atrium of the subject.

166. A method according to claim 164, comprising identifying that the subject is suffering from atrial fibrillation (AF) or from increased risk of thromboembolic events.

167. A method according to claim 164, wherein configuring the current comprises configuring the current to increase blood flow out of a left atrial auricle of the subject.

168. A method according to claim 164, wherein applying the current comprises applying the current during an occurrence of atrial fibrillation.

169. A method according to claim 164, wherein applying the current comprises applying the current in the absence of atrial fibrillation.

170. A method according to any one of claims 164-169, wherein the tissue includes cardiac tissue of the subject, and wherein applying the current comprises applying the current to the cardiac tissue.

171. A method according to any one of claims 164-169, wherein the tissue is selected from the list consisting of: atrial tissue, cardiac fat pad tissue, a pulmonary vein, a carotid artery, a carotid sinus, a vena cava vein, and an internal jugular vein, and wherein applying the current comprises applying the current to the selected tissue.

172. A method according to any one of claims 164-169, wherein the tissue includes a vagus nerve of the subject, and wherein applying the current comprises applying the current to the vagus nerve.

173. A method according to claim 172,

wherein applying the current comprises applying a stimulating current and an inhibiting current, and

wherein configuring the current comprises configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve, and configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

174. A method according to claim 172,

wherein applying the current comprises applying a stimulating current and an inhibiting current, and

wherein configuring the current comprises configuring the stimulating current to induce action potentials in the vagus nerve, and configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

175. A method according to claim 172, wherein configuring the current comprises:

during a first stimulation period, configuring the current to cause a reduction in a force of contraction of atrial cells of the subject; and

during a second stimulation period, configuring the current to cause an increase in the reduced force of contraction of the atrial cells.

176. A method according to claim 175, wherein configuring the current comprises setting the first stimulation period to have a duration of between about 100 milliseconds and about 1000 milliseconds.

177. A method according to claim 175, wherein configuring the current comprises setting the second stimulation period to have a duration of between about 200 milliseconds and about 15 seconds.

178. A method according to claim 175, wherein configuring the current comprises configuring the current to have a first frequency during the first stimulation period, and a

second frequency during the second stimulation period, the first frequency greater than the second frequency.

179. A method according to claim 175, wherein configuring the current comprises configuring the current to have a first amplitude during the first stimulation period, and a second amplitude during the second stimulation period, the first amplitude greater than the second amplitude.

180. A method according to claim 175, wherein applying the current comprises:

applying the current during the first stimulation period; and

withholding applying the current during the second stimulation period.

181. A method according to claim 175, wherein configuring the current comprises:

during the first stimulation period, configuring the current so as to induce action potentials in the vagus nerve; and

during the second stimulation period, configuring the current so as to block action potentials in the vagus nerve.

182. A method according to claim 175, wherein configuring the current comprises configuring the current so as to induce action potentials in the vagus nerve during the first and the second stimulation periods.

183. A method according to claim 175,

wherein applying the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject, and

wherein configuring the current comprises configuring each pulse of each of the bursts to have a pulse width of at least a first pulse width during the first stimulation period, and to have a pulse width of less than a second pulse width during the second stimulation period, the first pulse width being greater than or equal to the second pulse width.

184. A method according to claim 175,

wherein applying the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject, and

wherein configuring the current comprises configuring each of the bursts to have a number of pulses of at least a first number of pulses during the first stimulation period, and to have a number of pulses of less than a second number of pulses during the second

stimulation period, the first number of pulses being greater than or equal to the second number of pulses.

185. A method according to claim 175, comprising sensing at least one physiological variable of the subject, wherein configuring the current comprises synchronizing a commencement of at least one of the first and second stimulation periods with the sensed physiological variable.

186. A method according to claim 185, wherein the sensed physiological variable includes a QRS-complex of the subject, and wherein configuring the current comprises initiating the first stimulation period within about 50 milliseconds after an occurrence of the QRS-complex.

187. A method according to claim 185, wherein the sensed physiological variable includes an expiration by the subject, and wherein configuring the current comprises initiating the first stimulation period within about 500 milliseconds after a beginning of the expiration.

188. A method according to claim 185, wherein the sensed physiological variable includes diastole of the subject, and wherein configuring the current comprises initiating the second stimulation period substantially simultaneously with a portion of the diastole.

189. A treatment method, comprising:

applying an electrical current to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

repeatedly changing at least one parameter of the current, so as to restore normal sinus rhythm (NSR) of the subject.

190. A method according to claim 189, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve; and

configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

191. A method according to claim 189, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in the vagus nerve; and

configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

192. A method according to claim 189, wherein the parameter includes an amplitude of the current, and wherein repeatedly changing the parameter comprises repeatedly changing the amplitude of the current.

193. A method according to claim 189, wherein the parameter includes a frequency of the current, and wherein repeatedly changing the parameter comprises repeatedly changing the frequency of the current.

194. A method according to claim 189,

wherein applying the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject,

wherein the parameter includes a number of pulses in each of the bursts, and

wherein repeatedly changing the parameter comprises repeatedly changing the number of pulses in each of the bursts.

195. A method according to claim 189,

wherein applying the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject,

wherein the parameter includes a pulse width of pulses in each of the bursts, and

wherein repeatedly changing the parameter comprises repeatedly changing the pulse width of the pulses in each of the bursts.

196. A method according to claim 189, wherein applying the current comprises applying the current in pulses, wherein the parameter includes a pulse width of the pulses,

and wherein repeatedly changing the parameter comprises repeatedly changing the pulse width of the pulses.

197. A method according to claim 189, wherein the parameter includes an on/off status of the current, and wherein repeatedly changing the parameter comprises repeatedly changing the on/off status of the current.

198. A method according to claim 189, wherein repeatedly changing the parameter comprises:

during a first period, configuring the current so as to induce action potentials in the site; and

during a second period, configuring the current so as to block action potentials in the site.

199. A method according to claim 189, wherein repeatedly changing the parameter comprises repeatedly changing the parameter at a rate of between about one change per heart beat of the subject and about one change per 30 seconds.

200. A method according to claim 189, wherein repeatedly changing the parameter comprises repeatedly changing the parameter according to a predetermined pattern.

201. A method according to any one of claims 189-200, wherein repeatedly changing the parameter comprises repeatedly changing the parameter randomly.

202. A method according to claim 201, wherein repeatedly changing the parameter comprises repeatedly changing the parameter with an interval between each change of between about 500 milliseconds and about 30 seconds.

203. A method according to any one of claims 189-200, comprising detecting an occurrence of the AF, wherein applying the current comprises applying the current responsive to the detecting.

204. A treatment method, comprising:

during a first period, pacing a heart of a subject suffering from atrial fibrillation (AF), and applying an electrical current to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

during a second period following the first period, withholding applying the current to the site.

205. A method according to any one of claims 204 or 287, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve; and

configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

206. A method according to any one of claims 204 or 287, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in the vagus nerve; and

configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

207. A method according to any one of claims 204 or 287, comprising withholding pacing the heart during at least a portion of the second period.

208. A method according to any one of claims 204 or 287, comprising configuring the first period to have a duration of between about 500 milliseconds and about 30 seconds.

209. A method according to any one of claims 204 or 287, wherein applying the current during the first period comprises applying the electrical current substantially without changing the parameter during the first period, and with an amplitude greater than about 6 milliamps.

210. A method according to any one of claims 204 or 287, comprising detecting an occurrence of the AF, wherein pacing the heart and applying the current comprise pacing the heart and applying the current responsive to the detecting.

211. A method according to any one of claims 204 or 287, comprising detecting an occurrence of the AF, wherein withholding applying the current comprises withholding applying the current responsive to the detecting.

212. A treatment method, comprising:

during a first period, pacing a heart of a subject suffering from atrial fibrillation (AF), and applying an electrical current to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

detecting an occurrence of the AF; and

responsive to detecting the AF, during a second period following the first period, withholding applying the current to the site.

213. A method according to claim 212, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve; and

configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

214. A method according to claim 212, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in the vagus nerve; and

configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

215. A method according to claim 212, wherein pacing the heart and applying the current during the first period comprise pacing the heart and applying the current during the first period responsive to the detecting of the AF.

216. A method according to claim 212, comprising withholding pacing the heart during at least a portion of the second period.

217. A method according to claim 212, wherein applying the current during the first period comprises applying the electrical current substantially without changing a parameter of the current during the first period, and with an amplitude greater than about 6 milliamps.

218. A method according to claim 212, comprising detecting a P-wave of the subject, wherein withholding applying the current during the second period comprises withholding applying the current during the second period responsive to the detecting of the P-wave.

219. A method according to claim 212, wherein detecting the occurrence of the AF comprises sensing a measure of at least one ventricular response parameter, selected from the list consisting of: a ventricular response rate and a ventricular response variability.

220. A method according to claim 212, wherein detecting the occurrence of the AF comprises sensing a measure of pressure, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure.

221. A method according to claim 212, wherein detecting the occurrence of the AF comprises:

sensing a measure of pressure, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure;

sensing an indication of ventricular contraction; and

analyzing at least one relationship between the measure of the pressure and the indication of the ventricular contraction.

222. A method according to any one of claims 212-221, wherein detecting the occurrence of the AF comprises:

sensing an electrocardiogram (ECG) signal; and

analyzing a duration of an isoelectrical segment of the ECG signal.

223. A treatment method, comprising:

identifying a subject suffering from atrial fibrillation (AF) principally caused by heightened adrenergic tone;

applying, to a site of the subject, an electrical stimulating current, which current is capable of inducing action potentials in the site, the site selected from the list consisting

of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

configuring the stimulating current to restore normal sinus rhythm (NSR) of the subject.

224. A method according to claim 223,

wherein applying the stimulating current to the site comprises applying the stimulating current to the vagus nerve, and

wherein configuring the stimulating current comprises configuring the stimulating current so as to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set, and

comprising applying to the vagus nerve an inhibiting current, which is capable of inhibiting the induced action potentials traveling in the second set of nerve fibers.

225. A method according to claim 223, wherein applying the stimulating current to the site comprises applying the stimulating current to the vagus nerve, and comprising applying to the vagus nerve an inhibiting current, which is capable of inhibiting action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction towards a brain of the subject.

226. A method according to claim 223, comprising detecting an occurrence of the AF, wherein applying the stimulating current comprises applying the stimulating current responsive to the detecting of the AF.

227. A method according to claim 223, wherein applying the stimulating current comprises applying the stimulating current in respective bursts in each of a plurality of cardiac cycles of the subject, each pulse of each of the bursts having a pulse width of between about 0.5 milliseconds and about 1.5 milliseconds.

228. A method according to claim 223, wherein applying the stimulating current comprises applying the stimulating current in respective bursts in each of a plurality of cardiac cycles of the subject, each of the bursts having between about 1 and about 10 pulses.

229. A method according to any one of claims 223-228 or 360, wherein applying the stimulating current comprises applying the stimulating current in respective bursts synchronized with a cardiac cycle of the subject.

230. A method according to claim 229, wherein applying the stimulating current comprises applying a first pulse of each of the bursts after a delay from a sensed feature of an electrocardiogram (ECG) of the subject.

231. A method according to claim 230, wherein the sensed feature is selected from the list consisting of: a P-wave of the ECG and an R-wave of the ECG, and wherein applying the stimulating current comprises applying the first pulse after the delay from the selected sensed feature.

232. A method for use during defibrillation of a subject suffering from atrial fibrillation (AF), comprising:

applying an electrical current to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

configuring the current to reduce pain experienced by the subject during the defibrillation, by causing bradycardia and a decreased level of alertness during the defibrillation.

233. A method according to claim 232, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve; and

configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

234. A method according to claim 232, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in the vagus nerve; and

configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

235. A method according to claim 232,

wherein applying the stimulating current to the site comprises applying the stimulating current to the vagus nerve, and comprising:

applying an inhibiting electrical signal to the vagus nerve; and

configuring the inhibiting signal to block action potentials traveling in the vagus nerve in an afferent direction toward a brain of the subject.

236. A method according to claim 232, comprising pacing a heart of the subject if a heart rate of the subject falls below a predetermined rate responsive to applying the current configured to cause the decreased level of alertness.

237. A method according to claim 232, wherein configuring the current comprises configuring the current to have an amplitude of between about 4 and about 8 milliamps.

238. A method according to any one of claims 232-237, wherein configuring the current comprises applying the current in respective bursts in each of a plurality of cardiac cycles of the subject.

239. A method according to claim 238, wherein configuring the current comprises configuring each pulse of each of the bursts to have a pulse duration of between about 1 and about 3 milliseconds.

240. A method according to claim 238, wherein configuring the current comprises configuring each burst to have between about 6 and about 10 pulses.

241. A method for treating a subject suffering from atrial fibrillation (AF), comprising:

detecting the AF;

responsive to detecting the AF, applying an electrical current to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

during a first period beginning upon detecting the AF, configuring the current to attempt to restore normal sinus rhythm (NSR) of the subject;

determining whether NSR has been restored; and

during a second period beginning responsive to determining that NSR has not been restored within a threshold period of time after detecting the AF, configuring the current to maintain AF.

242. A method according to claim 241, comprising administering anticoagulation drug therapy to the subject during at least a portion of the second period.

243. A method according to claim 241, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in a first set and a second set of nerve fibers of the vagus nerve; and

configuring the inhibiting current to inhibit the induced action potentials traveling in the second set of nerve fibers, the nerve fibers in the second set having generally larger diameters than the nerve fibers in the first set.

244. A method according to claim 241, wherein applying the current to the site comprises:

applying a stimulating current and an inhibiting current to the vagus nerve;

configuring the stimulating current to induce action potentials in the vagus nerve; and

configuring the inhibiting current to inhibit action potentials induced by the stimulating current and traveling in the vagus nerve in an afferent direction toward a brain of the subject.

245. A method according to claim 241, wherein detecting the AF comprises detecting a P-wave of the subject.

246. A method according to claim 241, wherein detecting the AF comprises sensing a measure of at least one ventricular response parameter of the subject, selected from the list consisting of: a ventricular response rate and a ventricular response variability.

247. A method according to claim 241, wherein detecting the AF comprises sensing a measure of pressure of the subject, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure.

248. A method according to claim 241, wherein detecting the AF comprises:

sensing a measure of pressure of the subject, selected from the list consisting of: atrial pressure, venous pressure, and arterial pressure;

sensing an indication of ventricular contraction of the subject; and

analyzing at least one relationship between the measure of the pressure and the indication of the ventricular contraction.

249. A method according to claim 241, wherein detecting the AF comprises:

sensing an electrocardiogram (ECG) signal; and

analyzing a duration of an isoelectrical segment of the ECG signal.

250. A method according to claim 241, wherein configuring the current to attempt to restore NSR comprises repeatedly changing at least one parameter of the current.

251. A method according to claim 241, wherein configuring the current to attempt to restore NSR comprises:

during a pacing period within the first period, pacing a heart of the subject, and applying the current to the site; and

during a withholding period following the pacing period, withholding applying the current to the site.

252. A method according to claim 241, comprising generating a notification signal upon determining that NSR has been restored.

253. A method according to any one of claims 241-252, wherein configuring the current to maintain AF comprises maintaining a duration of the threshold period between about 24 and 54 hours.

254. A method according to claim 253, wherein configuring the current to maintain the AF comprises maintaining the duration of the threshold period between about 44 and 52 hours.

255. A method according to any one of claims 241-252, comprising recording a time of detecting of the AF.

256. A method according to claim 255, comprising outputting the recorded time upon interrogation by a user.

257. A method for stimulating a nerve of a subject, the nerve including a first set of fibers situated in a vicinity of an external surface of the nerve, and a second set of fibers situated in a vicinity of a longitudinal axis of the nerve, the method comprising applying to the nerve an electrical field defining a first activation function at the first set of fibers, and defining a second activation function at the second set of fibers, the first activation function less than about four times greater than the second activation function.

258. A method according to claim 257, comprising configuring the field to be such as to treat atrial fibrillation of the subject.

259. A method according to claim 257, comprising configuring the field to be such as to treat a thromboembolic risk of the subject.

260. A method according to claim 257, wherein applying the field comprises applying the field to the nerve from a distance of at least about 0.5 millimeters from the axis of the nerve.

261. A method according to claim 257, wherein the nerve includes a vagus nerve of the subject, and wherein applying the field comprises applying the field to the vagus nerve.

262. A method according to any one of claims 257-261, wherein applying the field comprises applying a current having an amplitude of at least 5 milliamps.

263. A method according to claim 262, wherein applying the field comprises applying the current having an amplitude of at least 7 milliamps.

264. A method for stimulating a nerve, comprising applying to the nerve, from one or more sites each having a distance of between about 1 and 4 millimeters from an axis of the nerve, a current having an amplitude of at least 5 milliamps.

265. A method according to claim 264, wherein applying the current comprises applying the current having an amplitude of at least 7 milliamps.

266. A method according to claim 264, wherein the nerve includes a vagus nerve of the subject, and wherein applying the current comprises applying the current to the vagus nerve.

267. A method according to claim 264, wherein applying the current comprises applying the current from at least about 1.5 millimeters from the axis of the nerve.

268. A method according to claim 264, wherein applying the current comprises applying the current from less than about 2 millimeters from the axis of the nerve.

269. A method according to claim 264, wherein applying the current comprises applying the current from at least about 3 millimeters from the axis of the nerve.

270. A method according to any one of claims 264-269, wherein applying the current comprises:

at a distance that is (a) greater than 0.5 millimeters from the axis of the nerve and (b) less than the distance of a first one of the sites from the axis of the nerve, providing inhibition of passage of the current between the first one of the sites and a second one of the sites; and

guiding the current, by means of the provided inhibition, to pass between the first and second sites at a distance less than 0.5 millimeters from the axis of the nerve.

271. A method according to claim 270, wherein providing the inhibition comprises providing the inhibition at a distance that is less than 3 millimeters from the axis of the nerve.

272. A method for stimulating a nerve including small-, medium-, and large-diameter fibers, the method comprising:

applying a cathodic current to the nerve at a cathodic site of the nerve, so as to stimulate the nerve, the cathodic current having a cathodic amplitude sufficient to induce action potentials in the medium- and large-diameter fibers, but generally insufficient to induce action potentials in the small-diameter fibers; and

simultaneously applying to the nerve, at an anodal site of the nerve, an anodal current, which is capable of inhibiting action potentials in the nerve, the anodal current having an anodal amplitude sufficient to inhibit action potentials in the large-diameter fibers, but generally insufficient to inhibit action potentials in the medium-diameter fibers.

273. A method according to claim 272,

wherein the nerve includes a vagus nerve of the subject,

wherein applying the cathodic current comprises applying the cathodic current at the cathodic site of the vagus nerve, and

wherein applying the anodal current comprises applying the anodal current at the anodal site of the vagus nerve.

274. A method according to any one of claims 272 or 273,

wherein the nerve includes a first set of fibers situated in a vicinity of an external surface of the nerve, and a second set of fibers situated in a vicinity of a longitudinal axis of the nerve, and

wherein applying the cathodic current comprises applying the cathodic current so as to generate an electrical field defining a first activation function at the first set of fibers, and defining a second activation function at the second set of fibers, the first activation function less than about four times greater than the second activation function.

275. A method according to claim 274, wherein applying the cathodic current comprises setting the cathodic amplitude to be between about 1 and about 10 milliamps.

276. A method according to claim 274, wherein applying the anodal current comprises setting the anodal amplitude to be between about 1 and about 10 milliamps.

277. A method according to any one of claims 272 or 273, comprising applying to the nerve, at a suppression anodal site of the nerve disposed so that the cathodic site is between the anodal site and the suppression anodal site, a suppression anodal current having a suppression anodal amplitude sufficient to inhibit action potentials induced in the nerve by the cathodic current and propagating in a direction from the cathodic site towards the suppression anodal site.

278. A method according to claim 277, wherein applying the suppression anodal current comprises setting the suppression anodal amplitude sufficient to inhibit a portion of the action potentials induced in the nerve by the cathodic current and propagating towards the suppression anodal site.

279. A method for stimulating a nerve, comprising:

applying to the nerve a stimulating current, which has a stimulating amplitude sufficient to induce action potentials in a first set and a second set of nerve fibers of the nerve, but not in a third set of nerve fibers of the nerve, the nerve fibers in the first set having generally larger diameters than the nerve fibers in the second set, and the nerve fibers in the second set having generally larger diameters than the nerve fibers in the third set; and

applying to the nerve an inhibiting current, which has an inhibiting amplitude sufficient to inhibit the induced action potentials in the first set of nerve fibers, but not in the second set of nerve fibers.

280. A method according to claim 279, wherein the nerve includes a vagus nerve of the subject, and wherein applying the stimulating and the inhibiting currents comprises applying the stimulating and the inhibiting currents to the vagus nerve.

281. A method according to claim 279,

wherein applying the stimulating current comprises configuring the stimulating current to induce the action potentials in an efferent therapeutic direction towards a heart of the subject, and

wherein applying the inhibiting current comprises configuring the inhibiting current to inhibit the induced action potentials traveling in the efferent therapeutic direction in the first set of nerve fibers.

282. A method according to claim 279,

wherein applying the stimulating current comprises configuring the stimulating current to induce the action potentials in an afferent therapeutic direction towards a brain of the subject, and

wherein applying the inhibiting current comprises configuring the inhibiting current to inhibit the induced action potentials traveling in the afferent therapeutic direction in the first set of nerve fibers.

283. A method according to any one of claims 279-282,

wherein the nerve includes a surface set of fibers situated in a vicinity of an external surface of the nerve, and an axial set of fibers situated in a vicinity of a longitudinal axis of the nerve, and

wherein applying the stimulating current comprises applying the stimulating current so as to generate an electrical field defining a first activation function at the surface set of fibers, and defining a second activation function at the axial set of fibers, the first activation function less than about four times greater than the second activation function.

284. A method according to claim 283, wherein applying the stimulating current comprises setting the stimulating amplitude to be between about 1 and about 10 milliamps.

285. A method according to claim 283, wherein applying the inhibiting current comprises setting the inhibiting amplitude to be between about 1 and about 10 milliamps.

286. Apparatus according to claim 61, wherein the control unit is adapted to configure a parameter of at least one of the periods to be such as to restore normal sinus rhythm (NSR) of the subject within 2 hours after initiation of the second period.

287. A method according to claim 204, comprising configuring a parameter of at least one of the periods to be such as to restore normal sinus rhythm (NSR) of the subject within 2 hours after initiation of the second period.

288. Apparatus for treating a subject, comprising:

an electrode device, adapted to be coupled to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to:

drive the electrode device to apply electrical stimulation to the site, and

configure the stimulation to prevent an occurrence of atrial fibrillation (AF).

289. Apparatus according to claim 288, wherein the control unit is configured to substantially continuously drive the electrode device to apply the stimulation during an application period lasting at least about 3 weeks.

290. Apparatus according to claim 288, wherein in an operating mode of the control unit, the control unit is adapted to drive the electrode device to apply the stimulation during an application period lasting at least about 3 weeks, and to configure the stimulation such that, during the application period, a longest duration of time in which no stimulation is applied is less than 4 hours.

291. Apparatus according to any one of claims 288-290, comprising a sensor, adapted to sense a physiological parameter of the subject, wherein the control unit is adapted to drive the electrode device to apply the stimulation responsive to the sensed physiological parameter.

292. Apparatus for treating a subject, comprising:

an electrode device, adapted to be coupled to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a

pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

a control unit, adapted to:

drive the electrode device to apply electrical stimulation to the site, and

configure the stimulation to reduce a probability of an occurrence of atrial fibrillation (AF).

293. Apparatus according to claim 292, wherein the control unit is configured to substantially continuously drive the electrode device to apply the stimulation during an application period lasting at least about 3 weeks.

294. Apparatus according to claim 292, wherein in an operating mode of the control unit, the control unit is adapted to drive the electrode device to apply the stimulation during an application period lasting at least about 3 weeks, and to configure the stimulation such that, during the period, a longest duration of time in which no stimulation is applied is less than 4 hours.

295. Apparatus according to any one of claims 292-294, comprising a sensor, adapted to sense a physiological parameter of the subject, wherein the control unit is adapted to drive the electrode device to apply the stimulation responsive to the sensed physiological parameter.

296. A method for treating a subject, comprising:

applying electrical stimulation to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

configuring the stimulation to prevent an occurrence of atrial fibrillation (AF).

297. A method according to claim 296, wherein applying the stimulation comprises substantially continuously applying the stimulation during an application period lasting at least about 3 weeks.

298. A method according to claim 296, wherein in an operating mode of applying the stimulation, applying the stimulation comprises applying the stimulation during an application period lasting at least about 3 weeks, and regulating the stimulation such that,

during the period, a longest duration of time in which no stimulation is applied is less than 4 hours.

299. A method according to any one of claims 296-298, comprising sensing a physiological parameter of the subject, wherein applying the stimulation comprises applying the stimulation responsive to the sensed physiological parameter.

300. A method for treating a subject, comprising:

applying an electrical stimulation to a site of the subject selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject; and

configuring the stimulation to reduce a probability of an occurrence of atrial fibrillation (AF).

301. A method according to claim 300, wherein applying the stimulation comprises substantially continuously applying the stimulation during an application period lasting at least about 3 weeks.

302. A method according to claim 300, wherein in an operating mode of applying the stimulation, applying the stimulation comprises applying the stimulation during an application period lasting at least about 3 weeks, and regulating the stimulation such that, during the period, a longest duration of time in which no stimulation is applied is less than 4 hours.

303. A method according to any one of claims 300-302, comprising sensing a physiological parameter of the subject, wherein applying the stimulation comprises applying the stimulation responsive to the sensed physiological parameter.

304. Treatment apparatus, comprising:

an electrode device, adapted to be coupled to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

a pacing device, adapted to be applied to a heart of the subject; and

a control unit, adapted to:

drive the electrode device to apply an electrical current to the site,

drive the pacing device to apply a pacing signal to the heart, and

configure the current and the pacing signal so as to treat the AF.

305. Apparatus according to claim 304, wherein the control unit is adapted to configure the pacing signal to have a pulse repletion interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

306. Apparatus according to claim 304, wherein the control unit is adapted to configure the pacing signal to have a pulse repetition interval having a duration of between about 15 ms and about 190 ms.

307. Apparatus according to claim 304, wherein the control unit is adapted to configure the current to modulate an atrial refractory period of the subject.

308. Apparatus according to any one of claims 304-307, wherein the control unit is adapted to modulate at least one parameter selected from the list consisting of: a parameter of the current, and a parameter of the pacing signal.

309. A treatment method, comprising:

applying an electrical current to a site of a subject suffering from atrial fibrillation (AF), the site selected from the list consisting of: a vagus nerve of the subject, an epicardial fat pad of the subject, a pulmonary vein of the subject, a carotid artery of the subject, a carotid sinus of the subject, a vena cava vein of the subject, and an internal jugular vein of the subject;

applying a pacing signal to a heart of the subject; and

configuring the current and the pacing signal so as to treat the AF.

310. A method according to claim 309, wherein configuring the pacing signal comprises configuring the pacing signal to have a pulse repetition interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

311. A method according to claim 309, wherein configuring the pacing signal comprises configuring the pacing signal to have a pulse repetition interval having a duration of between about 15 ms and about 190 ms.

312. A method according to claim 309, wherein configuring the current comprises configuring the current to modulate an atrial refractory period of the subject.

313. A method according to any one of claims 309-312, wherein configuring comprises modulating at least one parameter selected from the list consisting of: a parameter of the current, and a parameter of the pacing signal.

314. Apparatus according to claim 1, comprising a sensor adapted to detect a complex in a cardiac rhythm of the subject, and generate a sensor signal responsive thereto, wherein the control unit is adapted to receive the sensor signal, and to drive the electrode device to apply the current responsive to the sensor signal.

315. Apparatus according to claim 10, wherein the control unit is adapted to configure each pulse of each of the bursts to have a pulse duration of between about 0.5 and about 3 milliseconds.

316. Apparatus according to claim 10, wherein the control unit is adapted to configure each of the bursts to contain between about 1 and about 100 pulses.

317. Apparatus according to claim 54, wherein the control unit is adapted to repeatedly change a duration of at least one period selected from the list consisting of: an "on" period of the current, and an "off" period of the current.

318. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to configure the pacing device to pace the heart by applying a pacing signal to the heart having a pulse repetition interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

319. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to configure the current to modulate an atrial refractory period of the subject.

320. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to configure a parameter of the current selected from the list consisting of: an on/off time of the current, an amplitude of the current, a number of pulses of the current, a pulse repetition interval of the current, a frequency of pulses within a pulse burst of the current, a pulse width of pulses of the current, pulses per trigger of the current, a duty cycle of the current, and timing of the current within a cardiac cycle of the subject.

321. Apparatus according to any one of claims 61 or 286, wherein the control unit is adapted to configure a parameter of the pacing selected from the list consisting of: an on/off time of the pacing, an amplitude of the pacing, a number of pulses of the pacing, a pulse repetition interval of the pacing, a frequency of pulses within a pulse burst of the

pacing, a pulse width of pulses of the pacing, pulses per trigger of the pacing, a duty cycle of the pacing, and timing of the pacing within a cardiac cycle of the subject.

322. Apparatus according to claim 107, wherein the control unit is adapted to configure the pacing device to pace the heart by applying a pacing signal to the heart having a pulse repetition interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

323. Apparatus according to claim 107, wherein the control unit is adapted to configure the current to modulate an atrial refractory period of the subject.

324. Apparatus according to claim 107, wherein the control unit is adapted to configure a parameter of the current selected from the list consisting of: an on/off time of the current, an amplitude of the current, a number of pulses of the current, a pulse repetition interval of the current, a frequency of pulses within a pulse burst of the current, a pulse width of pulses of the current, pulses per trigger of the current, a duty cycle of the current, and timing of the current within a cardiac cycle of the subject.

325. Apparatus according to claim 107, wherein the control unit is adapted to configure a parameter of the pacing selected from the list consisting of: an on/off time of the pacing, an amplitude of the pacing, a number of pulses of the pacing, a pulse repetition interval of the pacing, a frequency of pulses within a pulse burst of the pacing, a pulse width of pulses of the pacing, pulses per trigger of the pacing, a duty cycle of the pacing, and timing of the pacing within a cardiac cycle of the subject.

326. A method according to claim 140, comprising detecting a complex in a cardiac rhythm of the subject, wherein applying the current comprises applying the current responsive to the detecting.

327. A method according to claim 151, wherein configuring the current comprises configuring each pulse of each of the bursts to have a pulse duration of between about 0.5 and about 3 milliseconds.

328. A method according to claim 151, wherein configuring the current comprises configuring each of the bursts to contain between about 1 and about 100 pulses.

329. A method according to claim 197, wherein repeatedly changing the parameter comprises repeatedly changing a duration of at least one period selected from the list consisting of: an "on" period of the current, and an "off" period of the current.

330. A method according to any one of claims 204 or 287, wherein pacing the heart comprises applying a pacing signal to the heart having a pulse repetition interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

331. A method according to any one of claims 204 or 287, wherein applying the current comprises configuring the current to modulate an atrial refractory period of the subject.

332. A method according to any one of claims 204 or 287, wherein applying the current comprises configuring a parameter of the current selected from the list consisting of: an on/off time of the current, an amplitude of the current, a number of pulses of the current, a pulse repetition interval of the current, a frequency of pulses within a pulse burst of the current, a pulse width of pulses of the current, pulses per trigger of the current, a duty cycle of the current, and timing of the current within a cardiac cycle of the subject.

333. A method according to any one of claims 204 or 287, wherein pacing the heart comprises configuring a parameter of the pacing selected from the list consisting of: an on/off time of the pacing, an amplitude of the pacing, a number of pulses of the pacing, a pulse repetition interval of the pacing, a frequency of pulses within a pulse burst of the pacing, a pulse width of pulses of the pacing, pulses per trigger of the pacing, a duty cycle of the pacing, and timing of the pacing within a cardiac cycle of the subject.

334. A method according to claim 251, wherein pacing the heart comprises applying a pacing signal to the heart having a pulse repetition interval having a duration of between about 50% and about 200% of an atrial refractory period of the subject.

335. A method according to claim 251, wherein applying the current comprises configuring the current to modulate an atrial refractory period of the subject.

336. A method according to claim 251, wherein applying the current comprises configuring a parameter of the current selected from the list consisting of: an on/off time of the current, an amplitude of the current, a number of pulses of the current, a pulse repetition interval of the current, a frequency of pulses within a pulse burst of the current, a pulse width of pulses of the current, pulses per trigger of the current, a duty cycle of the current, and timing of the current within a cardiac cycle of the subject.

337. A method according to claim 251, wherein pacing the heart comprises configuring a parameter of the pacing selected from the list consisting of: an on/off time of the pacing,

an amplitude of the pacing, a number of pulses of the pacing, a pulse repetition interval of the pacing, a frequency of pulses within a pulse burst of the pacing, a pulse width of pulses of the pacing, pulses per trigger of the pacing, a duty cycle of the pacing, and timing of the pacing within a cardiac cycle of the subject.

338. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the vagus nerve, and wherein the electrode device is adapted to be coupled to the vagus nerve.

339. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the epicardial fat pad, and wherein the electrode device is adapted to be coupled to the epicardial fat pad.

340. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the pulmonary vein, and wherein the electrode device is adapted to be coupled to the pulmonary vein.

341. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the carotid artery, and wherein the electrode device is adapted to be coupled to the carotid artery.

342. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the carotid sinus, and wherein the electrode device is adapted to be coupled to the carotid sinus.

343. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the vena cava vein, and wherein the electrode device is adapted to be coupled to the vena cava vein.

344. Apparatus according to any one of claims 1, 46, 61, 69, 80, 89, 98, 288, 292, or 304, wherein the site includes the internal jugular vein, and wherein the electrode device is adapted to be coupled to the internal jugular vein.

345. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the vagus nerve.

346. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the epicardial fat pad.

347. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the pulmonary vein.

348. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the carotid artery.

349. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the carotid sinus.

350. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the vena cava vein.

351. A method according to any one of claims 140, 189, 204, 212, 223, 232, 241, or 309, wherein applying the current to the site comprises applying the current to the internal jugular vein.

352. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the vagus nerve.

353. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the epicardial fat pad.

354. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the pulmonary vein.

355. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the carotid artery.

356. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the carotid sinus.

357. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the vena cava vein.

358. A method according to any one of claims 296 or 300, wherein applying the stimulation to the site comprises applying the stimulation to the internal jugular vein.

359. Apparatus according to claim 80, wherein the control unit is adapted to drive the electrode device to apply the current, substantially without changing a parameter of the current.

360. A method according to claim 223, wherein applying the current comprises applying the current substantially without changing a parameter of the current.